The Northwestern MILLER

MILLING PRODUCTION SECTION

MILL MONITOR

An oft-repeated criticism or comment from flour mill superintendents is to the effect that one must wait too long to find out how his mill has been performing, that the time lapse between the actual milling of wheat into flour and determination of yield figures, etc., is in most mills a pretty wide gap.

In their theorizing about the "mill of tomorrow" or the "automatic" mill, many millers have placed the need for a rapid and positive check of mill performance high on their lists of features to incorporate in those dream mills. In a typical mill of the present, it is necessary to wait until the mix has been ground out and packed before the superintendent can get some idea about the flour yield, feed production, pack-off, etc.

That need for an automatic recording device has brought about the development and introduction of the "Massometer" by Wallace & Tiernan, Inc., and one miller, H. R. Klink, general superintendent of the Roanoke City (Va.) Mills, wonders "how we ever got along as well as we did without Massometers." Mr. Klink frankly and simply says, "They're wonderful." He says:

Continuous Record

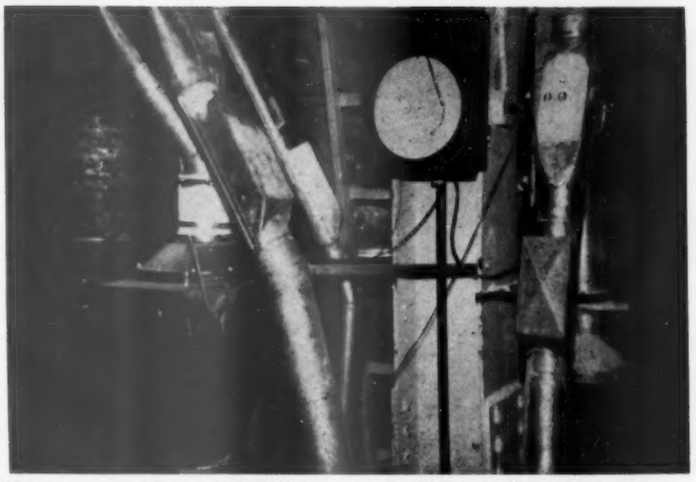
"The Massometers record the rate of production of flour in each of three streams on a 24-hour basis, and the charts provide us with an accurate and continuous record of mill operation as it is being made. They give us an instantaneous indication of any change in flow taking place in the mill and thus give the miller an opportunity to make adjustments to the machinery at the time, not later.

"The Massometers bring to light any interference or variation in the mill operation. By the proper use of the recording devices it is possible to determine accurately the percentage or yields of each grade of flour and to totalize the amount being produced. This makes it possible for the miller to figure his yields at any time during the 24-hour operation of the mill. Thus, the Massometers overcome the method of spot-checking which has proven, in our experience, not too accurate and not too dependable for the simple reason that variations occur which do not go in harmony with spot-checking.

"The machines also establish a permanent record as to the exact time of mill operation or the amount of flour produced, serving as a record for comparison in inventory. By logging the operation of the Massometers carefully, it is possible to determine packing weight or evaporative losses during the flour manufacturing process."

Measures Flow

The Massometer is just what its name says it is: A machine to measure the flow (mass) of flowable solids by weight. The engineers describe it as a "force balance" type of instrument, and tests have established its consistent accuracy to be within 1% from 10% to 100% of the machine's capacity.



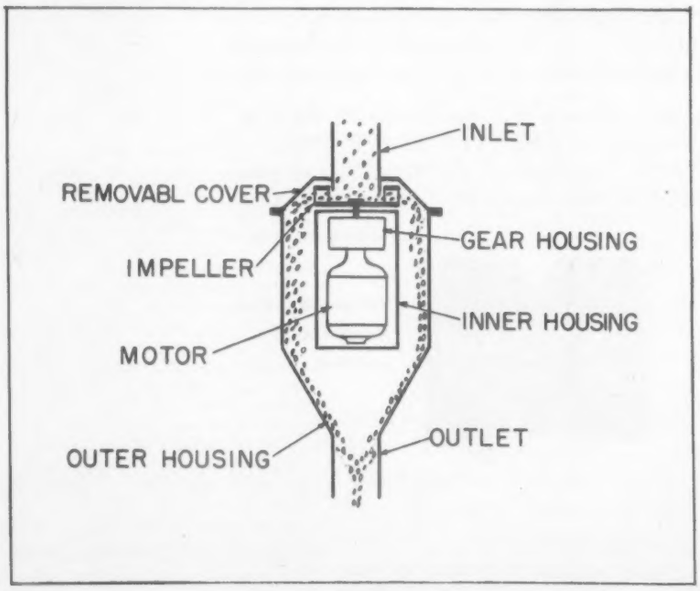
Here is a massometer installation in a mill. The recording instrument can be located anywhere in the mill.

The apparatus is installed so that the stream of material to be weighed or measured falls on the center of a horizontal impeller which is rotated by a constant-speed electric motor.

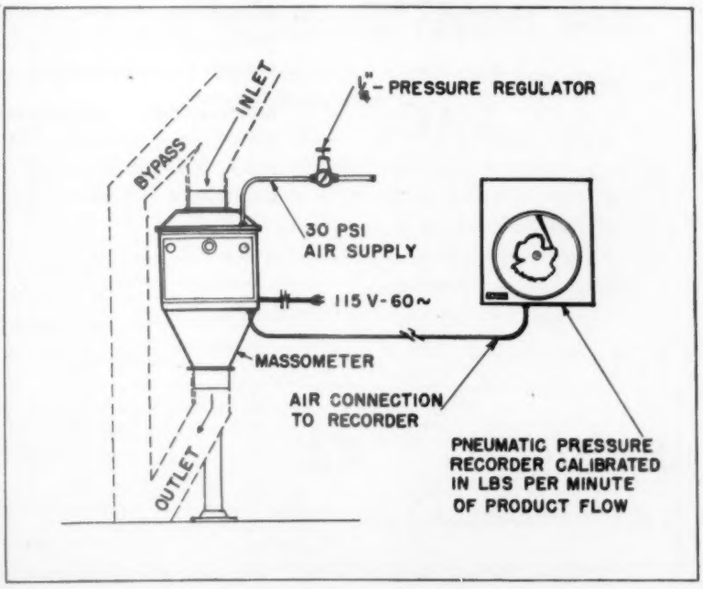
The flour (or whatever material is being metered) falls onto the rotating impeller and creates a reactive twist or torque in direct proportion to the amount of material passing over the impeller. This reactive torque is applied to a lever system in such a way that it may be balanced by applying air pressure to a small cylinder or capsule. The air pressure to the bucking or compensating capsule is measured continuously on a conventional pneumatic pressure recorder.

Since the reactive torque is directly proportional to the rate of material flow, and the pressure required in the bucking capsule is directly propor-

(Continued on page 14a)



Schematic flow diagram.



Sketch of Massometer installation.

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FACT 2: **Composition of PY-RAN** . . . this compound is a new, coated, anhydrous monocalcium phosphate leavening agent just put on the market by Monsanto.

FACT 3: **How coating helps** . . . each granule of PY-RAN has moisture-absorbent covering which protects it against premature reaction during storage.

FACT 4: **Stability's effect on shelf-life** . . . aging tests conclusively prove PY-RAN's superior stability increases the life of prepared mixes and self-rising flour.

FACT 5: **Stability's effect on CO_2 release** . . . greater stability of PY-RAN assures a controlled release of gas, even after long storage. Tests clearly prove PY-RAN releases less CO_2 during first two minutes of mixing of dough or batter. *More CO_2 is available for release during oven baking.*

FACT 6: **Other PY-RAN advantages** . . . slow, controlled release of gas, as produced by PY-RAN, gives excellent texture and volume, plus good crust and crumb color. Tunneling is virtually eliminated.

FACT 7: **Blending** . . . PY-RAN will blend perfectly with other leavening phosphates such as Monsanto SAPP and HT phosphates. Monsanto's completely equipped food laboratory will show you the best methods.

FACT 8: **Information** . . . to get accurate, authentic information on PY-RAN or copy of new booklet, "MONSANTO PHOSPHATE LEAVENING AGENTS," write to MONSANTO CHEMICAL COMPANY, Inorganic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

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MANKIND

Closer Adoption of European Milling System to Shorter North American System

By Denys W. Povey
Thomas Robinson & Son, Ltd.

When comparing the varying mill-systems and techniques in many different countries of the world, there are in every case specific reasons for the differences, and it would not be right to say that one particular system is the best and suited to all conditions. There are good points in all, and this applies equally to the European as well as to the American milling systems. The European system has of necessity, and for other reasons, been developed to such a degree that perhaps it may be considered the most adaptable and most elastic of all and, whilst there are features of the American system that could be employed with benefit by European millers, there are numerous features of the European system that I believe could be embodied with considerable benefit into the North American system.

EDITOR'S NOTE: One of the speakers at the 1954 technical conference of the Association of Operative Millers was Denys W. Povey, technical executive and milling engineer, Thomas Robinson & Son, Ltd., Rochdale, England. Mr. Povey was among the participants in a forum of the world's largest mill designers and builders. One of the subjects which he discussed was the "closer adoption of the European milling system to the shorter American system." The accompanying article is from his talk on that subject and is reprinted from the British journal, Milling.

Let me make it clear right away that I am not suggesting that a milling plant designed exclusively to European standards would give better results here in North America—it would not; but I do suggest that the European system and plant modified to suit your particular conditions and requirements would.

Earlier I stated that the European system was perhaps the most adaptable and elastic of all and I believe the reasons for this are that:

(1) European mills have to be equipped to grind wheats from nearly every country of the world.

(2) The quality of the wheats vary considerably and are more often than not what here in North America you would regard as low grade.

(3) For economic reasons it has nearly always been necessary to obtain the highest possible extraction conducive with maintaining a competitive quality.

(4) The average European mill has to be designed to produce many and varied qualities of flour from inferior wheats, and I hope you will excuse me if at this stage I refer to one of America's most famous millers—Louis Gibson — who said that any miller could make good flour from good wheat but it takes a good miller to make good flour from poor wheat.

(5) European millers have had the benefit of the various milling engineering firms, all of international repute; these firms have designed, equipped and erected mills all over the world and have carried out ambitious and far-sighted research programs, all of which have contributed to the general fund of information available to millers.

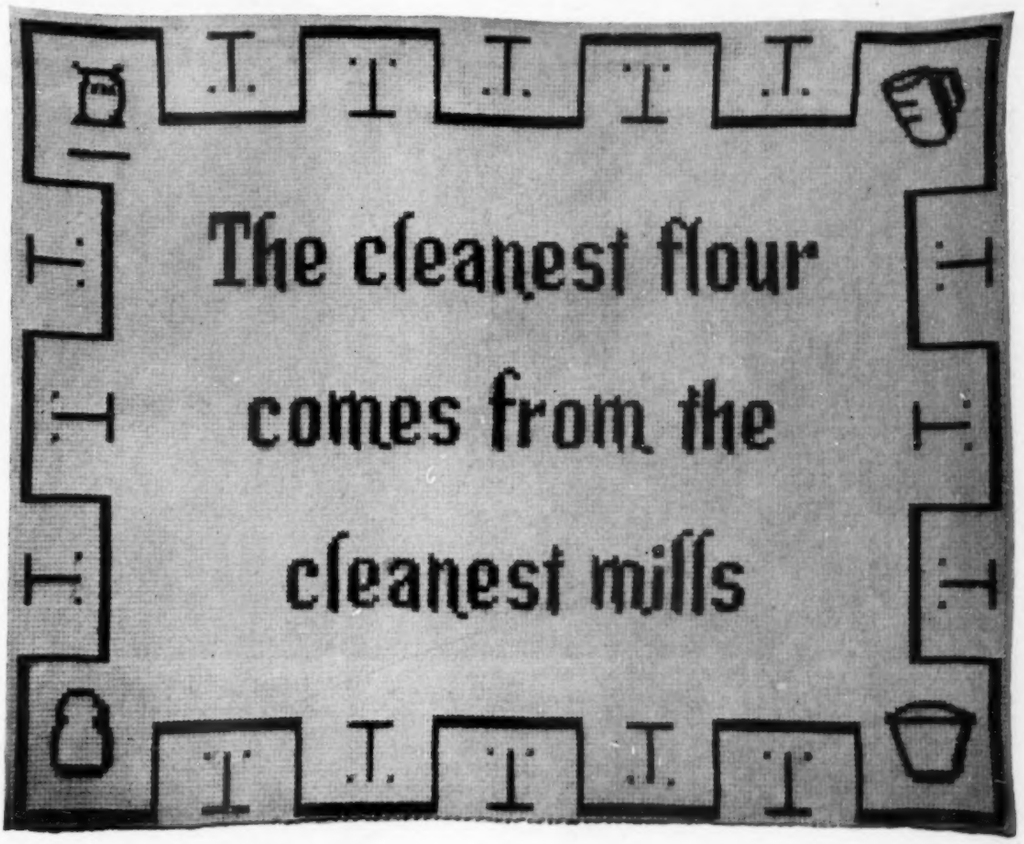
Now I would like to refer to those features of the European system that I believe could be incorporated into the American system with benefit.

I would list these features as follows: graded breaks; improved grading of stocks to purifiers and better purification; "scratch" systems; more roll surface at the head of the mill; roll corrugations to suit local conditions.

Graded Breaks

I do not think that anyone can dispute the benefits to be obtained from grading the break passages into coarse and fine, permitting a more exacting separation of the endosperm from the bran skins to be made, minimizing the damage and ultimate powdering of the bran.

Where it is necessary to mill fairly dry as in North America, I consider that grading breaks into coarse and



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fine are all the more important, but I would stress that it is essential to corrugate the rolls to suit the task that they are required to perform; this is most important.

Improved Grading of Stocks to Purifiers and Better Purification

I have grouped "improved grading of stock to purifiers with better purification" because the two go hand in hand. The finest purifiers in the world cannot do really good work unless the feeds are well graded. I cannot stress the importance of this careful grading too much and even badly designed purifiers will benefit if the feeds to them are well graded; in brief, if a purifier sieve is to give of its best, it must be given one specific task and not be asked to purify stock containing a large range of particle sizes.

The design of the purifiers themselves is of the greatest importance. European engineers have carried out a great deal of practical experimental work into their design, and have carefully studied millers' requirements, particularly in European mills, where it is required to produce flours of low ash content at high extractions from sometimes very poor wheat, and are of the opinion that the European purifier is basically far superior to any other.

There are now available single, double and treble tier machines; all have their points and particular applications; numerous and varied claims have been made for each type, all are good for the particular purpose for which they are intended, and having seen them all in operation in mills, I have my own views on the subject, but these are outside the scope of this paper, so I will say no more than to express my confidence in the superiority of the European design.

Scratch System

The European "scratch" system is designed to treat particles of sizings and coarse first middlings that have pieces of bran attached so that pure or relatively pure particles only pass to rolls for reduction into middlings or flour. "Chunks" do not normally pass to the scratch rolls, as they are usually directed from the tails of the 1st and 2nd break purifiers to the next break fine roll; thus, you will observe another advantage to be gained from graded breaks.

The scratch system which may consist of between two and four passages normally has its own roll, sifter and purification units; its aim is to remove adhering bran particles without the production of bran powder and to produce clean coarse middlings for reduction. The system is employed with particular success in British mills and I believe that such a system, which is an enlargement and refinement upon what you refer to as chunks and sizings passages, would prove of benefit in a great number of North American mills, particularly when milling spring wheats at a lower moisture content than is normally considered ideal.

More Roll Surface at the Head of the Mill

You will be well aware that European mills have what you would consider to be excessive roll surface; one of the reasons for this is that wheats are milled at a much higher moisture content and the wheat mixture ground is invariably softer. Now I am certainly not advocating general increases in roll surface for North American conditions, but I am of the opinion that ample roll surface at the head of the mill is desirable, particularly on the 1st break, the 2nd break and perhaps the 3rd as well. The break system is the key to the whole milling system, and good or bad work here is reflected throughout the whole mill. Ample surface insures good work, and I am of the opinion that relatively high releases on the 1st and 2nd breaks are to be advocated as the bran is tough at this stage and can resist the harsh treatment, enabling the later breaks to be set to scrape away gently the remaining endosperm from the bran skins instead of having to "hit it hard," with resultant expensive bran powdering. If high releases are to be obtained at the head of the mill, ample roll surface is essential.

Roll Corrugations

The subject of roll corrugation specifications is an important one because unless the corrugations are ideally suited to the work they have to perform, the best milling results are not possible.

A very great deal of research work and experiments under practical conditions have been carried out in Europe by milling engineers in conjunction with millers, and when designing a new plant or remodelling an existing mill, great importance is rightly attached to the specification of corrugations. I know that I am going to invite trouble for myself, but I am going to say it: I believe that the great majority of North American millers when they specify corrugations select one of a number of accepted standards, standards that have existed over a period of a great number of years, and the particular specification is selected because it has always been used in the past. If a new standard is taken, it is done in the hope that it will prove better. Please do not think I am unduly criticizing operative millers—I am most certainly not; what I am doing is to suggest that North American operative millers could benefit from the vast experience gained by European milling engineers in the field

The granary weevil, one of the many pests controlled by Dow fumigants, is one of the hungriest beetles of the weevil group. It develops from a tiny larva which grew inside a single kernel of grain. About the size of a small grain of rice, this pest destroys more grain in proportion to its weight than would be consumed by a horse. It is one of the primary threats to stored grain.

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Dow Methyl Bromide for general space, vault, box car and tarpaulin fumigation . . . Dowfume® EB-5 for control of stored grain pests in elevator storage bins . . . Dowfume EB-15 for spot fumigations in machinery to prevent insect buildup between general space fumigations with Dow Methyl Bromide . . . Dow Mill and Bin Spray (containing Lindane) for residual spray, space spray or fog-type aerosol application. THE DOW CHEMICAL COMPANY, Fumigant Sales Department, Midland, Michigan.

you can depend on DOW FUMIGANTS DOW

of roll corrugation and their influence on milling operations.

Before leaving the subject of roll corrugation, I would like to refer to the importance of having an even curtain of feed spread along the whole width of the roll and the need for sensitive and accurate means of setting the grinding rolls; these, as you will all be aware, are vitally important features, and I believe that the roller mills of European design have advantages over others in this respect.

In concluding this section of my address, I would like to reiterate that, in my opinion, European millers can learn something from North American millers, but my subject has been on those features of the European system that, in my opinion, could be applied with benefit to the North American system. You may think that I have been speaking too much in praise of the European method, so I would like to finish by saying that progress is only achieved by taking into consideration other people's experiences and views, selecting the best features of all sides and moulding them to suit local conditions. We would be foolish to believe that we cannot learn from others.

May I thank you all for giving me the opportunity of being able to tell you about some of the features of our European milling system that I think are of interest to North American millers.

——BREAD IS THE STAFF OF LIFE——

MILLION-BUSHEL EXPANSION

EMPORIA, KANSAS — Emporia will have storage facilities for a million more bushels of grain than at present, if current construction plans materialize. Work has already started on a 500,000-bu. addition to the elevator of the Kansas Soya Products Co. and an application has been filed by the Emporia Elevator & Feeding Co. for permission to erect another 500,000-bu. storage facility. Completion of the two projects will boost grain storage space in Emporia to 2,350,000 bu.

——BREAD IS THE STAFF OF LIFE——

Richardson Announces System for Blending

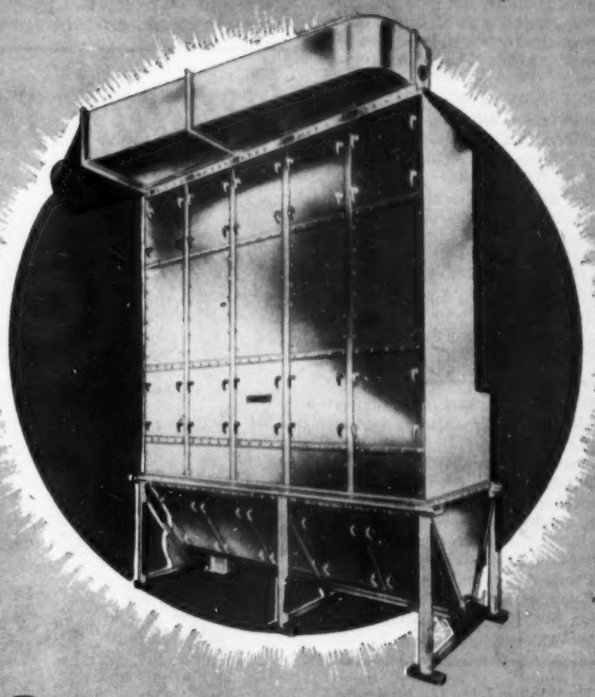
CLIFTON, N.J. — The Richardson Scale Co. has announced a new remote weight-control system for continuously and accurately blending additives with process material.

Features of the system include batch weighing of additives, continuous weighing of process material and the remote selection of weight ratios using a single dial control. The system, the company said, provides rigid process control, immediate start-up, quick formula changing, precise weighing of additives and operation over a wide range of weight ratios.

Products handled include feeds, foods, fertilizers and various other commodities.

Components of the system are an automatic hopper scale, electric control system control panel and a constant-weight belt feeder. Process material drops on the belt feeder and discharges into a mixer. Batches of the additive material are weighed out and automatically discharged into the same mixer. The signal for discharge of additives is transmitted by an impulser on the belt feeder. In that way the flow of material leaving the belt feeder determines the rate of discharge of additive.

THE SIMON SUCTION FILTER DUST COLLECTOR IS BETTER THAN EVER!!!



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The Khapra Beetle—a New Threat to Grain Handlers

By Dr. R. T. Cotton
U.S. Department of Agriculture

The discovery of the Khapra beetle, Trogoderma granarium Everts, in Tulare County, Cal., in November, 1953, should be of considerable interest to all handlers of grain and grain products, for it is the only remaining serious pest of stored grain not previously known to have become established on the North American continent.

The last serious pest of stored grain to obtain a foothold in the U.S. was the lesser grain borer, Rhyzopertha dominica (F.). This borer became established here about 100 years ago and has gradually spread until it is troublesome in many parts of the country.

The Khapra beetle is said to be the worst pest of stored grain in India. It is native to India, Ceylon and Malaya but has been introduced and has become established in England, Europe, U.S.S.R., China, Japan, Korea, Philippine Islands, Australia, Madagascar, Syria, Africa, Iraq and Nigeria.

EDITOR'S NOTE: The accompanying article tells of the Khapra beetle, a new threat in the U.S. to handlers and processors of grain. The author, Dr. R. T. Cotton, is a leading authority on pests of stored grain and grain products. He is now located in Washington, D. C., after formerly being at Manhattan, Kansas. He is with the Stored-Product Insect Section, Biological Sciences Branch, Agricultural Marketing Service, U. S. Department of Agriculture.

For many years we felt secure from this cosmopolitan pest of stored grain in the belief that our climate was too rigorous for it to survive the winter and become established. However, when we compare the published information regarding the temperature limits within which it can survive and breed, we find that its ability to live under adverse weather conditions compares favorably with that of other serious pests of stored grain in this country. We may therefore expect it to thrive in many of our grain-growing regions and in our storage houses.

Biology and Habits

Information regarding the biology and habits of the Khapra beetle has been summarized by Voelkel (1924), Hinton (1945), and more recently by Freeman (1951). Temperatures between 90°F. and 99°F. are said to be optimum; however, Freeman places the upper limit for development at 104°F. He states that larvae cease to develop at 46° F. but resist 14°F. for short periods.

The Khapra beetle adult is a small beetle 1.8 to 3.0 mm. in length, pale red-brown, to dark brown or black in color with wing covers uni-colorous or with indistinct red-brown markings. It is hairy on top, but often the hairs are rubbed off so that it has a slick appearance. The larvae are yellowish brown and clothed with long brown hairs; the integument between the segments and the underside of the body is pale yellow in color. Viewed from above the yellowish brown segments and paler skin separating them give the larvae a ringed appearance. It is a dermestid like the black carpet beetle and is somewhat of a scavenger. It is one of the few members of this group that prefer dried vegetable matter to animal matter as food. Grain damaged by the feeding of this insect has somewhat the same appearance as grain damaged by the lesser grain borer.

Adult females lay up to 126 eggs. The life cycle varies in length from 4 to 6 weeks to several years depending upon the temperature and food supply. According to Freeman, there may be as many as 12 generations of this insect annually in India. The larvae are highly resistant to starvation and are said to live for months or years without food.

The discovery of the Khapra beetle in warehouses at Alpaugh and Angiola in Tulare County, Cal., in November, 1953, led to an investigation of the origin of the infestation. The California State Department of Agriculture discovered evidence that would indicate that it was present in the San Joaquin Valley in 1946 or earlier.

A warehouse company near Fresno, Cal., first noticed damage to

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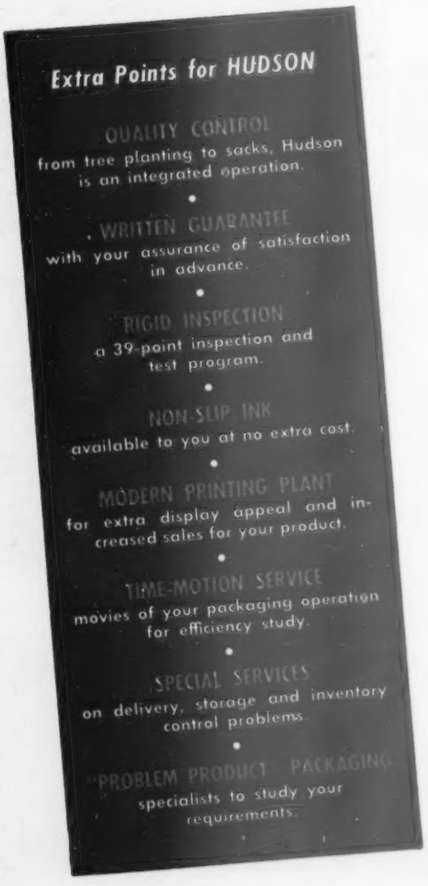
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Users long believed that Hudson Multiwall Sacks offered the surest, safest protection for their products. To prove it we went to the independent testing service, The U. S. Testing Company, asked them to find out.

To make their comparisons, U. S. Testing buys in the open market samples of Hudson Multiwalls, along with sacks of other manufacturers — tests them by standards far more severe than the toughest service they'll ever get in actual use.

The result: of all multiwall sacks tested, only Hudson received the coveted Seal of Approval. And note that this testing is continuous . . . new tests are made *each* month. The U. S. Testing Seal, found only on Hudson Multiwalls, is your proof that Hudson sacks are *regularly* tested and certified for performance.

For you: this means you can now assure your customers that your products receive the same fine quality control from raw material to *delivered* product. You can show dramatically with the Hudson Multiwall Seal of Approval that product, production and packaging are consistently the best money can buy! Your Hudson representative can give you the details behind "certified" performance!

stored grain in its warehouses by an insect incorrectly identified by a commercial pest control operator as the black carpet beetle. Despite control measures this insect had increased to such proportions by 1949 that some 300 tons of grain in the warehouse were a total loss. In 1949 this company abandoned the warehouse for grain storage purposes. However, used sacks from this warehouse were transported to Alpaugh and Angiola where the infestations that were discovered in 1953 developed. Dead adults and larval skins found at Fresno in 1953 were identified as the Khapra beetle. How this insect was introduced into Fresno is not known. Since 1946 it has spread south from Tulare County through the Imperial Valley to Arizona and the eastern border of New Mexico.

It has but feeble powers of migration so that like other pests of stored grain, its spread has been accomplished through the avenues of trade.

Spread of the Insect

The habit of re-using grain and feed sacks and the large volume of sales and exchanges of these bags between feed and seed dealers and farmers are responsible in part for the spread of the insect. The unrestricted shipping of seed, feed and grain from infested establishments has caused the spread of this insect over a wide area already, and will cause a further spread unless restrictions are imposed. The transportation of infested grain, feed or seed in railway box cars can result in the wholesale contamination of the rolling stock of the country, with the danger that infestation will be spread throughout the U.S. Most railway boxcars are so constructed that the end and side linings harbor large quantities of waste grain and milled cereal products that are always available for the establishment of insect infestations.

As a result of a survey conducted by the Economic Insect Survey Section of the Plant Pest Control Branch, Agricultural Research Service, U.S. Department of Agriculture, L. J. Padget (1954) reports that infestations of the Khapra beetle are now know to exist as follows:

Arizona—Maricopa County, 5; Pinal County, 1; Pima County, 1; Yuma County, 1; Mohave County, 1.

California — Imperial County, 5; Kern County, 2; Riverside County, 1; Tulare County, 2; Fresno County, 1.

New Mexico—Roosevelt County, 1; Curry County, 2.

Hard to Combat

The insect itself is not materially more resistant to fumigants and residual sprays than many other pests of stored grain. It is, however, more difficult to combat owing to the troublesome habit of the larvae of crowding into spaces in the structure of buildings, bins, etc. where it is almost impossible to reach them with sprays or fumigants. Little success has been achieved to date in eradicating this insect from premises that have become infested.

The insect breeds so rapidly under favorable conditions that the larvae often appear in enormous profusion in the surface layers of binned grain. They leave quantities of barbed hairs in the grain that are said to be a serious menace if swallowed.

The fact that this insect does not spread rapidly of its own accord gives hope that by prompt action it can be prevented from spreading materially beyond its present distribution. Unless drastic measures are taken to prevent its spread, this insect may well prove to be as serious a pest of stored grain in this country as it has in others. Grain handlers noticing unusual infestations in stored grain, in seed, box cars, etc. should call them to the attention of state or federal authorities.

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—BREAD IS THE STAFF OF LIFE—

New Station for Pest Research Established

WASHINGTON—Establishment of a new field station for research on stored-grain insects at Mesa, Ariz., has been announced by the U.S. Department of Agriculture. A major project at the station, in cooperation with the agricultural experiment stations of Arizona and California, will be an attack on the Khapra beetle, a pest infesting grain, seeds, and grain products in many other parts of the world and recently discovered in the U.S. So far, the infestation is limited to certain areas in California, Arizona, and New Mexico.

The new research station is being set up at the invitation of the directors of western state experiment stations.

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The Changing Dimensions Of Our Responsibilities

By Dr. C. H. Bailey

When I was a student of science around the turn of the century, the physical area of our observations was covered by the vision of a 40-in. reflecting telescope at the maximum extremes and a compound microscope fitted with a one-twelfth inch objective. One peered into space at astral objects 100 million light years distant, the other discerned minute objects measured in terms of microns.

The other day I checked on the extent to which this area of observation had been increased in the interval. Thus, my colleague in the department of astronomy advised that the comparatively new 200-in. reflecting telescope picked up light from stellar objects one billion light years away, or ten times as remote as with the 40-in. model. Then I consulted R. B. Fischer's book on the electron microscope and learned that its useful magnification is about 200 times that of the best microscope of my student days. Thus, it appears conservative to assert that the range in area of observation has increased during this interval by the order of about 2,000 times—a very tidy factor indeed.

With my slide rule in hand, I was then tempted to compute the ratio between the diameter of the sphere bounded by the range of observation of the 200-in. telescope on the one hand, namely, $12x10^{28}$ miles, and the strom, or one millionth millimeter in diameter of gold particles 10 Ang-diamteer on the other hand. If I haven't lost any ciphers along the line, the diameter of this gold particle must be multiplied by about $36x10^{39}$ to record the ratio between the smaller and the larger distance or interval in space.

But our detailed study of the dimensions of the units of matter doesn't stop here. By less direct but equally exact methods the physicists have dissected the atom as it were, not only in terms of inter-atomic distances in space, but even in terms of the component units of the smallest atom, and their mass and behavior. Thus, electrons, neutrons, protons and the mesons have become as

HERE'S HOW

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DAY BOLTED BINS (above) are ideal for bulk storage and bulk mixing of materials. They can be installed where other types won't fit and their capacity increased simply by adding bolted sections. If necessary they can be unbolted and moved to new locations with only erection costs to consider.

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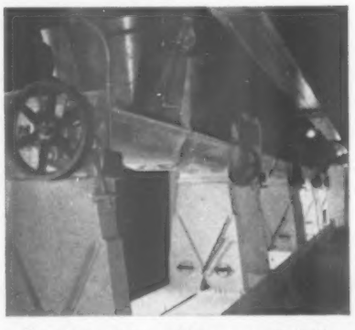

Photo shows bottom of hoppers on DAY Bins discharging into DAY Twin Screw Feeders. This feed mechanism ensures smooth handling and accurate blending.

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familiar as was the atom itself in the days of Mendeleff.

Parallel to these studies has been the identification of isotopes, certain of them radioactive, and of the enormous release of energy accompanying the chain reaction of fission of some of the heavier elements (ex. uranium 235, and plutonium) or the conjugation of the lightest elements (ex. hydrogen).

New Instruments

Along with these refinements of our knowledge of the constitution of matter, and our actual visual observation of its components and of the universe, there has resulted a parallel development of our ability to measure quantitatively some of the structures, materials and properties of matter. Thus, many new instruments have been developed to that end, including, for example, X-ray spectroscopy, which has enabled us to actually measure interatomic distances as in crystals and various compounds. Also, we have devised controls in terms of minute distances and intervals of time. The February 1954 issue of Product Engineering describes a camera capable of taking pictures in one-tenth of one millionth of a second, by taking advantage of the electronic orientation of nitrobenzene crystals which essentially function as a shutter in transmitting light. In other words, with refined and expanded knowledge and area of observation, come equivalent refinements in instrumentation, and accuracy of measurement and controls.

The efforts to resolve our knowledge with definiteness and detail have not been confined to the physical realm. During the same period, major advances have been made in the biochemical and physiological fields. Various vitamins have emerged from the hazy state of mysterious physiological application to become definite chemical entities, capable of synthesis and commercial production in quantity. This knowledge of chemical constitution is gradually being tied into a more exact understanding of the mechanism of their action in the essential physiological processes with which they are associated. It has also greatly facilitated their identification and quantitative estimation in natural food products. Their production in quantity has tended to make them more abundantly available and at greatly reduced costs.

Contributes Greatly

What has been said of the vitamins is becoming increasingly true of other natural biocatalysts, such as enzymes, antibiotics, herbicides, insecticides and the like. The specific groups that are most functional in either catalyst, or substrate or both are gradually becoming apparent. This contributes greatly to an understanding of not only the mechanism of their action, but of their control and manipulation, to the advantage of man in his competition with other species, and in the improvement of his environment and food supply.

Involved in these properties is the detail of oxidation-reduction potential, and its primary significance in many phenomena of life. Thus, biophysics appears on the scene, with all the advantages that it affords in indirect observations or measurements that can be made oftentimes without destroying the tissue or system, or interfering with the normal sequence of events. Analagous to this property and physical exchange of electrons, is the secondary covalence, or hydrogen bonding such as is involved in water-binding or imbibition. The physical state of the water thus involved can be observed by appropriate electrical devices, which may be calibrated to measure the free and bound water in the system. This, in turn, may be closely related to, or even the reason for, the relative level of certain reactions of life, or of induced biochemical sequences. Again, it may be observed and recorded without destruction or substantial modification of the tissue, or the colloidal gel in which these reactions are progressing.

An entire session could be devoted to the properties of this substance water. Not only does it function in the majority of biochemical reactions, as solvent, and also appearing as a component in hydrolyses, but it is actually possessed of properties quite different from those that would be predicted from the formula H_2O that is ordinarily but incorrectly written. The level of moisture content in many tissues and structures or organisms frequently determines the level of biological activity. This is commonly discerned in plant growth in its relation to the hydration of the substrate, commonly soil, in the level

EDITOR'S NOTE: The accompanying article is the text of one of the principal addresses at the annual meeting of the American Association of Cereal Chemists. The author, Dr. C. H. Bailey, is dean emeritus, Institute of Agriculture, University of Minnesota.

Making Your Bags is Our Full-Time Job

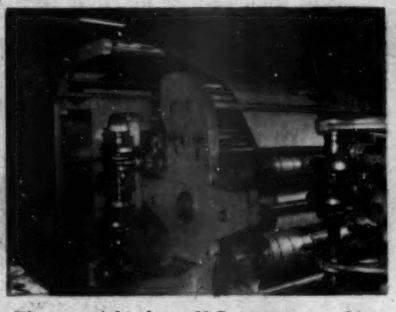

Photo at right shows V-C engravers making printing plates. Well-designed, expertly printed bags have real sales appeal—put your product out front. Photo above shows one of V-C's multi-color printing presses.

A battery of sewing machines staffed by highly-trained operators and inspectors. Modern machinery, skilled operators, and diligent inspectors, mean better-built, longer-lasting V-C Bags for your product.

THE BAG you use to package your product is only one of many items essential to your business success. But to the V-C Bag Division, the manufacture of better bags is a full-time job. That's why it will pay you to discuss your bag problems with a V-C representative. Possibly he can make suggestions that will improve or lower the cost of your packaging. Let him tell you about V-C's expert designing, printing, construction, and speedy service and delivery of V-C Multiwall Bags.

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of respiration of seed tissue and of associated organisms in grain storage, in the relation of water-imbibition or hydration capacity of the natural colloidal materials of foods and the consequent ratio of free water, and the osmotic pressure of solutes dissolved in it. Thus, every fundamental study of this common, but unique substance may contribute substantially to a better understanding of the properties and behavior of systems of which it is a part.

Simplifying Approaches

I have deliberately mentioned these several basic phenomena to afford an opening to stress a generality at this point. As I indicated before, there may at first glance apear to be a vast accumulation of details in our expanding knowledge. To an extent that is true; at any rate, we are making more definite applications of our knowledge at many points. But I further suggest—nay, emphasize—that our increased understanding of the fundamentals is really simplifying our approaches to their application. Actually, the basic systems are simpler rather than more complex, since they become more orderly and precise. Take the relation of the older Mendeleff periodic system to our present graphic depiction of the electronic arrangement in the outer orbit of the atoms. The latter bears a rather specific relationship to the properties of the atom, its behavior in the presence of other elements, and the characteristics of compounds that are formed with it.

What is said in this connection is, or is likely to become in due course, true of many of the more complex substances, or systems, and the dynamic phenomena of which they are a part, such as enzymic reactions, vitamins and antibiotics. The trend of our times, thus, is in the direction of simplification. It becomes our task to really comprehend these basic principles, and reason out the applications which concern us. I have in mind, in this connection, the painful rule of thumb manner in which we were taught to extract square roots while 7th graders, compared to the simplicity of the algebraic equation $(a + b)^2 = a^2 + 2ab + b^2$ to which our class was introduced in high school a couple years later.

Many empiricisms that must be memorized may be replaced by a few basic formulas which find wide application. This not only facilitates their immediate application to some problem that has long beset us, but often leads to an extension of our knowledge into areas which are quite outside the range of our previous interests. We find an example of this in the comparatively recent processes of atomic fission in its relation to what is properly described as atomic energy. What has occurred in the physical realm may conceivably evolve in due course in the area of medicants, physical therapy, and other facilities which contribute to the comfort, health and longevity of the human individual as well as to his destruction.

Involved in Entire Range

The cereal chemists collectively, by virtue of the intermediate position many of them occupy between the production of the basic raw materials or cereals and their final incorporation into the diet, find themselves involved, or at least interested in the entire range of these extremes. For some time past, the cereal technology laboratories have provided the facilities for testing the properties and practical qualities of new varieties produced by plant geneticists. Conceivably many of these properties are hereditary, or result from a combination of hereditary characters, and hence are expressed in the make-up of the genes which effect transmission to the offspring. Thus the chemist, wittingly or otherwise, becomes involved in genetic behavior, and can apply certain techniques to the quantitative measurement of useful characteristics of the offspring of a crossed or mixed parentage.

Closely related to these characteristics of the cereals, to be sure, are the nature and magnitude of their reaction to variations in their chemical and physical environment. As our knowledge of the fundamental physiological processes advances through cooperation of chemist and agronomist, the convenience and economy of certain manipulations of the environment of the grain plants become more apparent. Thus, great economies have been effected in certain sections of the world in the useful application of fertilizers, or the use of irrigation water, or the development of cultivation and harvesting practices, through this combination of chemical and physiological controls. One instance came to my attention recently where a relatively simple biophysical technique extended the use of the available supply of irrigation water by the order of 20%. In another crop zone the application of nitrogenous fertilizers in harmony with the chemistry of plant growth greatly increased the economy of the operation, both in terms of yields and quality of the cereal crop.

As we advance through the biological sequence of events from seeding, to the consumption of cereals as human food, we encounter instance after instance where the cooperation of the chemist and other scientists leads to singularly useful results. Actually the functioning of insecticides, and of many fungicides really devolves upon biochemical reactions.

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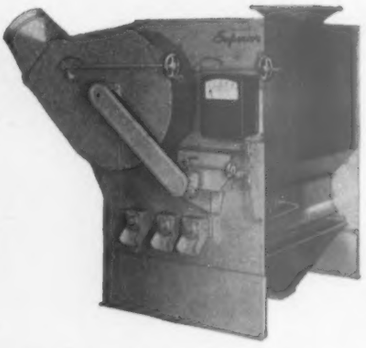

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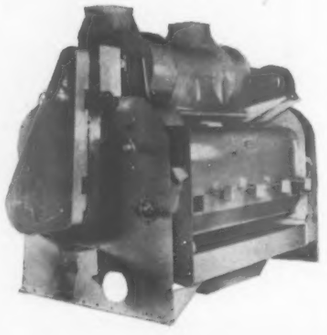

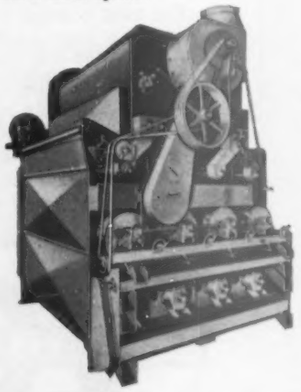

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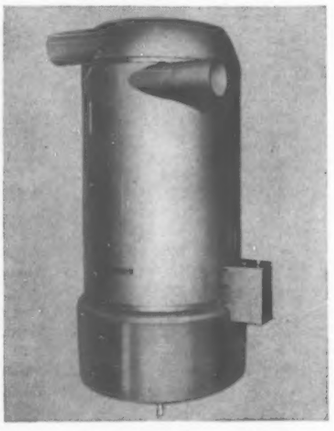

tinuous and non-varying under almost all temperature and humidity conditions. The Superior Air Centrifuge utilizes a patented impelled-centrifuge principle to reach an efficiency never before possible on particles of very small size.

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The better these are understood and elucidated, the greater the progress that can be registered in not only the effective and economical use of such materials as are now available, but also in the synthesis of new biocides which are more useful than any that have been produced before. Sometimes a relatively simple chemical modification of one small radical or segment of one of these reagents will greatly increase its effectiveness. Trial and error sometimes succeeds in such instances, but a scientific and orderly attack upon the problem is often more effective in the long run.

Passing reference has already been made to certain phases of nutrition that have received particular attention in recent times. Prominent in this connection, to be sure, is the development of enrichment, using that term in its broadest sense. Again, the disclosure of the chemical structure of certain vitamins, leading, in several instances to their synthesis in quantity, did much to render them more generally available to the consuming public. Also these pure substances become available as controls or checks in developing quantitative methods for determining their concentration in natural and supplemented foods. It then becomes necessary to (1) ascertain the requirements of humans insofar as these and other nutrients including minerals are concerned, (2) to determine their concentration in the normal diet of the population to be served, and (3) to thus compute the supplementation of enrichment necessary to adjust the diet to an optimum level.

The cooperation between various groups of specialists in this country several years ago when this issue was prominent was most heartening. Cereal chemists applied new analytical and assay techniques to both raw materials, intermediates, and finished products of their industry, and generously shared their experiences and data with their colleagues, and with Committees of the National Research Council, Food and Drug Administration, Millers National Federation, and otherwise. Thus a substantial and significant background of data was rapidly accumulated, which enormously facilitated the evolution of standards based upon sound information. As such interests and practices spread through other areas of the world, certain local issues become significant, to be sure, such, for example, as to whether metabolizable calcium compounds should be included in the formula of enrichment mixtures for particular populations. Obviously, the decisions in such instances need to be based in part upon the results of satisfactory surveys of the diets of the people involved.

Incidentally, I sat with a committee recently, which included distinguished American nutrition specialists from the east coast, far west, and central states. They stressed the fact that it has now become almost impossible to find patients afflicted with certain vitamin-deficiency diseases that were relatively common in certain areas a decade or two ago. That is a real and significant tribute to the practical success of programs that have been in practice of late, including education, improved food technology and enrichment.

Applying the Details

Now, in conclusion, let us refer back to an issue that has been mentioned in passing, namely how to acquire familiarity with, and apply the seemingly vast number of details of research results that are being reported in a steady stream at meetings of scientific societies, and in the technical journals. I would stress again that, in many instances, these details can be fitted into a pattern which is relatively orderly, and can be reduced to certain principles or formulas. Periodically some genius appears upon the scene who assists mightily in that fundamental process. At other times we must undertake a part of the task for ourselves as we endeavor to extend these principles into an area where they have not previously found application. Now the pronoun "we" is used here in a generic or editorial sense, since the activities of several minds are best applied at times to such undertaking.

If such a coterie of minds is not available in one's immediate environment, then arrangements must be effected that will bring them into touch with our problems. Sometimes the staff of a college or research institute may include an individual who can contribute mightily to the task. Apart from actual consultantship arrangements, a procedure that not infrequently leads to useful results is to invite such a specialist to participate in a program or symposium concerned with a new area of application of interest to us. Such symposia can be made extremely effective in acquainting those in attendance with the latest developments in a definite and restricted area of dynamic scientific interest.

Moreover, the specialist's attention may thus be directed to an area of application that had not concerned him before. His alert and trained mind then continues to grapple with specific issues of application after the event in question. He may either go back to his well-equipped laboratory to conduct further researches, or sit down at his desk with a computing machine and calculate certain end results that are enormously valuable in a practical way. We, who figuratively

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Superior's new Exbinner is the easy answer to that difficult problem of reclaiming non-free-flowing materials from your deep storage bins.

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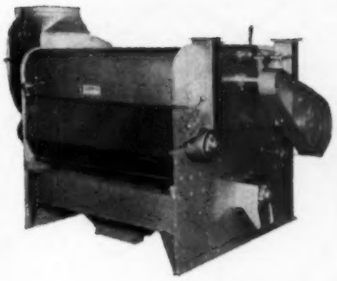

C11 LENGTH GRADER—The C11 is a simple, yet extremely accurate cylinder machine designed for length separations only. It may be installed singly, or in banks four or five high. Only two moving parts for long life. The two-high arrangement is shown here. The machine can be equipped with an indent cylinder to reclaim wheat or durum from oats and barley tailings coming from other equipment in your mill flow.

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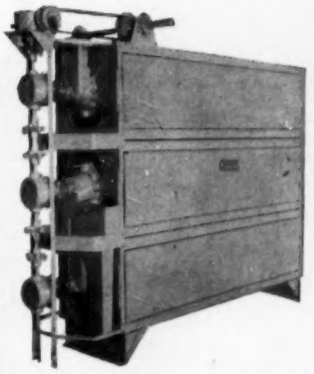

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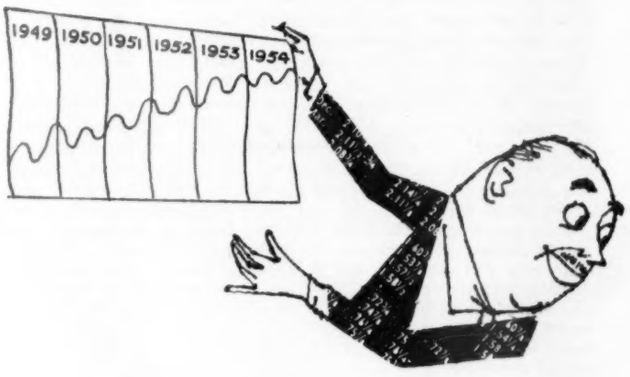
"WE'RE HEDGING NEXT SUMMER'S SALES NOW, SON"
MINNEAPOLIS
KANSAS CITY
Cash Grain Sales
OFFICIAL CHICAGO BOARD OF TRADE
REPORT FOR WEDNESDAY, AUG. 4, 1954
(Consigned Grain—Each line represents sale of one car, unless otherwise noted)

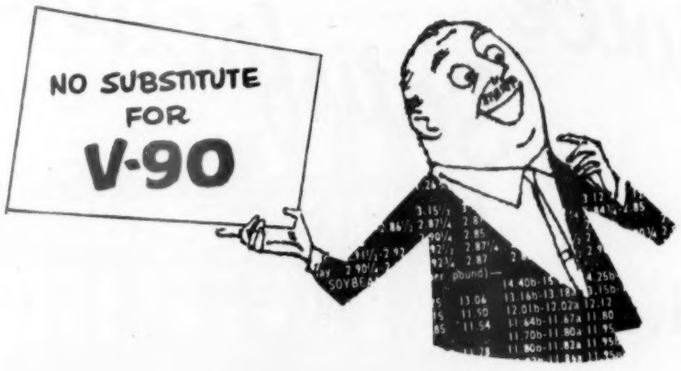
Upandcomer: "Hedging against sales? Complaints? Next summer? Never heard of it! How do you do it?"

Old Timer: "Yep! You can just about count on it. Next summer is going to be another time of testing for self-rising flour and corn meal. It'll be too late *then* to worry about sales dropping off or about complaints caused by heat and humidity. That's why we're hedging against those possibilities *right now*."



Upandcomer: "Yes, Old Timer, but how do you *know* you're going to get that protection from the phosphate you will be using next summer?"

Old Timer: "Well, Sonny, it's like this. We know from experience that the leavening used in self-rising flour and corn meal is sensitive to heat and humidity. It *has* to be or else our self-rising products wouldn't bake up nice and pretty in the kitchen. That's why we're mighty careful to use a phosphate that is *steady* enough to stand up under summer heat and humidity. That's why we have no worries about "summer complaints" and why our self-rising flour and corn meal business has shown a steady increase over the past several years."



Upandcomer: "Uhmmmmmmm. Sure makes sense."

Old Timer: "That's easy! We've used V-90 for *15 summers*. We *know* its stability record. We *know* what happens when our self-rising flour and corn meal reaches the kitchens of our customers. Our *experience* tells us and our sales tell us that there is no substitute for V-90. So, to protect next summer's sales, we hedge now by contracting for V-90 . . . the *only* phosphate that has stood the test of 15 summers."

YOU'RE SAFE...YOU'RE SURE...WITH V-90®

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VICTOR CHEMICAL WORKS

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speaking, are looking over his shoulder during these processes, are also becoming trained in both fundamentals, and their application to an extent that may enable us to carry on from that point.

Good library facilities, using that term in its broadest sense, are an essential part of our sum-total of essentials. New techniques are being developed to render the stored knowledge on our book shelves more readily available. In the March 1, 1954, issue of Industrial and Engineering News is an interesting description of some new and practical applications of IBM punch cards which renders well-nigh automatic the sorting out of specific citations to recent and current literature in all areas of the chemical sciences thus codified. In fact, the author of this speculative paper suggests that further machine developments can be expected to provide more rapid searches than possible with punched cards. Magnetized spots on tape, transparent or opaque spots in films, holes in teletype tape, etc. are suggested as possible of application. At any rate, it is heartening to note that serious thought is being given to saving the time and eyes of the next generation of thoughtful students who need quickly the complete literature of a particular technical subject.

Another phase of this broad general problem of keeping informed as a sustained and continuing process, is that of the usefulness of periodicals designed specifically to that end. Science, Nature (England), American Scientist, Scientific American, Popular Science Monthly, and Science News Letter are among the excellent periodicals in the English language. I wonder how many of you have made use of Endeavor, published quarterly by Imperial Chemical Industries Limited in London, England? It has made use of the services of thoroughly competent scientists in the preparation of articles that are readable and understandable.

In proper sequence many of the applied phases of these discussions make their appearance in the excellent technical and trade journals, which are very alert in the interests of the industries that they serve.

The growing significance of such publications is emphasized by the recent organization in Boston of the Society of Technical Writers. It is comprised of writers who have the job of conveying technical information to people who must use it directly. The very fact of its organization in itself emphasizes the growing recognition of the need for improved skills in the presentation of scientific findings before a reading audience of nonspecialists. It holds out a hope of improved publications that will be of greater service to many of us.

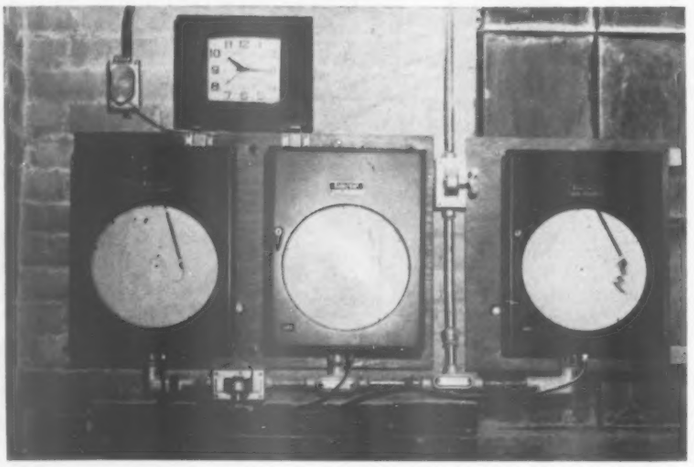
Thus several forces are at work that should combine to facilitate the communication of new scientific and technical findings, both fundamental and practical to those who are not actually attached to the research staffs where the studies originate.

MASSOMETER

(Continued from page 1a)

tional to the reactive torque, then the air pressure is directly proportional to the rate of material flow.

The lever system connected to the motor housing is pre-loaded so that an air pressure of 3 lb. per square inch is required to balance the system when no material flows through the recording instrument. The pneumatic recorder is set so that the pen reads zero on the chart when a pressure of 3 lb. per square inch is applied to the recorder and reads maximum when a pressure of 15 lb. is applied.



Three pneumatic recorders for three Massometers installed at Roanoke City Mills.

Maximum capacity of present models of the Massometer is based on materials having a density of 40 lb. per cu. ft. or a rate of flow of 6 cu. ft. per minute. Standard charts are available for maximum flow rates of 30, 40, 50, 60, 80, 100, 125, 150 and 200 lb. per minute. Materials with a maximum particle dimension of one half inch will pass through the recording instrument. The moisture content of the material being measured is relatively unimportant except where corrosive or stick materials are handled.

The Massometer may be used to measure the flow of any free-flowing solid material such as grain, feed, seed, food mixtures, etc. The instrument may be used for materials accounting, process control, batch control, or as a proportioning controller.

Materials being loaded or unloaded in bulk can be accurately metered by weight. Inventory and plant production records can be kept with the Massometer as material is moved from one process to another. A six digit electronic integrator mounted in the recorder case is available as an optional accessory to provide a summation of the amount of material metered. The integrator has the same accuracy as the recorder.

In process control, the instanta-

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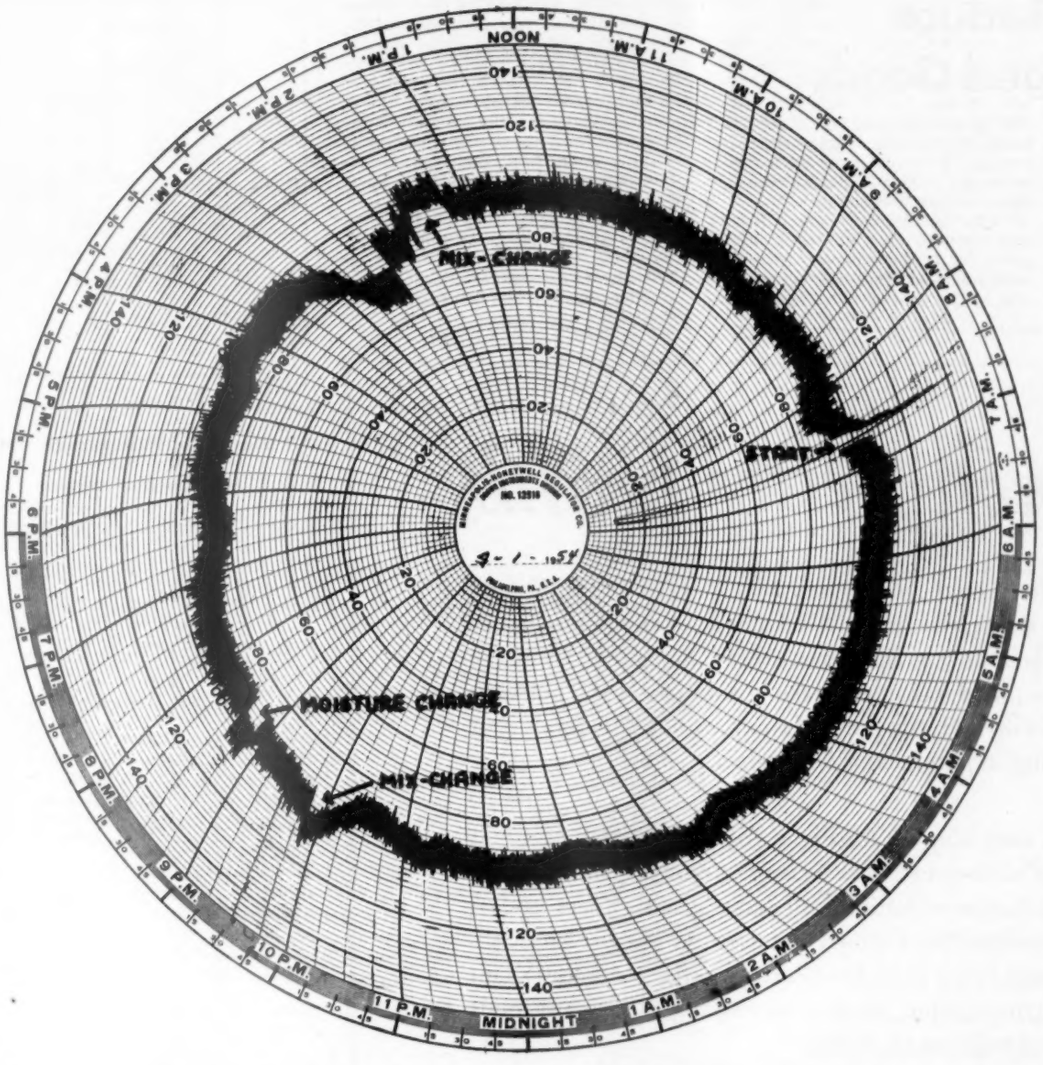

Here is a sample chart from the pneumatic pressure recorder of the Massometer. The chart covers a 24-hour period.

neous response to changes in flow makes it a valuable instrument to control critical processes. The daily operating diary for a given process is recorded on the pneumatic recorder chart. Any stoppage or variation of flow due to machinery breakdown etc. may be seen immediately on the pneumatic recorder chart.

When it is necessary to add a definite amount of an ingredient to a batch or process, the Massometer may be preset to deliver a given amount. When the electronic integrator totals this amount, the equipment can be arranged so that a signal will automatically stop the flow. The pneumatic output of the instrument may also be used to control other feeders or regulators. The feed rate will then be proportional to the flow of material measured by the Massometer.

With the installation of the Massometer, actual mill methods or procedures remain unchanged, making it unnecessary to "re-educate" mill personnel to new procedures. By the same token, the elimination of the old-fashioned guesswork is achieved, especially when roll settings are changed, plus the ability of the Massometer to record the exact moment when any change is made.

The mill superintendent may, by examining the charts for any specific period, detect when changes were made in the mill flow and it is up to the miller in charge to make his explanations.

The only requirements for installation of the Massometer are 110-Volt, 60-Cycle current and an air supply of 60 lb. per square inch. Control features relative to the air supply are an integral part of the machine, including air reducing valves and cleaners.

The unit is sealed and is tamperproof. It is, in effect, a 24-hour monitor for the mill's operation. All superintendents are anxious to know their flour yields, here at last is a machine that gives a continuous picture of the mill's operation.

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Tapes Used to Reduce Damage to Bagged Goods

Another new method has been developed to ease the constant materials handling problem of how to reduce the amount of damage to bagged goods while in transit.

This new method involves the use of a pressure-sensitive tape which is said to be "so strong that a single strand could tow a boxcar."

Use of the tape by many commodity goods shippers, it is reported, has helped reduce damage claims an average of 70% in most cases, while for some it has eliminated damage claims almost completely.

Strips of Scotch brand filament tape are used for unitizing bagged goods in boxcar doorway areas to reduce side-shifting, bulging and tipping of the doorway load against the car's storm doors while en route.

The method was developed in cooperation with bagged goods shippers by the Minnesota Mining & Manufacturing Co., St. Paul, manufacturer of Scotch brand filament tapes. It has been used successfully on cloth, crepe and multiwall paper bags—bags containing flour, feed, fertilizer chemicals, sugar and various other granular or small product bagged goods.

Currently such firms as Pillsbury Mills, Inc., Colorado Milling & Elevator Co., Godchaux Sugars and Lion Oil are using one or more of the proved versions of the methods of unitizing loads in doorway areas with tape.

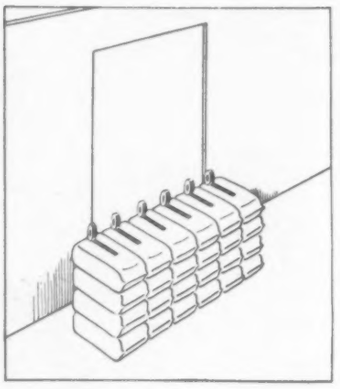

Figure 1

Recommended Method

One of the versions is recommended by Minnesota Mining & Manufacturing and the Association of American Railroads for all-around use on all types of bagged goods shipments (considering a normal doorway load as being three rows wide, six rows long and eight bags high).

Here is how it is done:

Begin by stacking the first row of bags to half the intended height across the doorway area—about 1 to 1½ ft. in from the door and side of the car. The tape (from individual rolls) is then secured to the top bag in each stack (Fig. 1), and unrolled toward the dead door or door opening with the adhesive side of the tape against the bags.

This row is then stacked to full height, and after giving each roll a half twist to bring the tape's adhesive surface into play, the tape is pulled up the side of the row and secured to the top bag in each stack. The second row of bags is then stacked to full height. (Fig. 2)

Row three (Fig. 3) is simply a duplication of row one—the only difference being that the additional rolls of tape are unrolled toward the loading door. The row is then stacked to full height, and the rolls of tape from rows one and three are overlapped (Fig. 4) tightly across the top of the load—forming a splice about 1½ ft. long.

The job is complete as soon as the rolls are removed. If added tension is needed, it can be effected by placing two or three extra bags across the tape bonds on top of the natural "valleys" that will occur between the rows.

Users of this method have found that an average of 87 ft. of 1-inch-wide filament tape is needed to unitize the doorway loads in each car at an average materials cost of $1.25

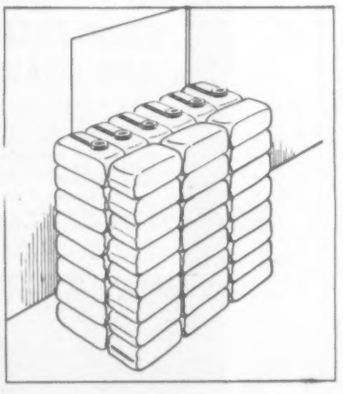

Figure 2

—to promote better health

TO promote better health, mere enactment of laws is insufficient. Experience has shown that effective education of the public in nutritional matters depends to a great extent on the dissemination of the principles of nutrition, food values and related subjects. If the public is properly educated, it will naturally prefer the *improved* staple foods over those which are lacking in good nutritional value.

THE practice of enriching or fortifying foods for better health is becoming more widespread. For example, enrichment of many cereal foods, the fortification of certain fruit and vegetable juices, and of margarine, are accomplished facts in the United States. The list lengthens because food processors know that, fundamentally, the most important factor in foods is nutritive value. So they are making their good foods better—to the benefit of millions of people.

THE firm of Hoffmann-La Roche has for many years pioneered in the production of vitamins for the food and other industries throughout the world. These vitamins, synthesized by chemists, are identical with those existing naturally and are manufactured on a large scale at a much lower cost than if they were extracted from natural sources. These are the vitamins that are used for flour and bread enrichment, the process which to a great extent restores important nutritional values which are unavoidably lost in the milling and processing of wheat when fine, white flour is produced. Rice, corn and other cereal grains are similarly restored and fortified.

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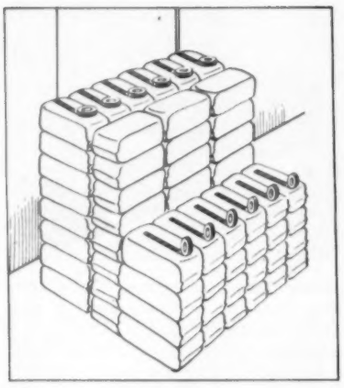

Figure 3

per car. In addition, most say they have found that the taping method accounts for a labor saving of more than half the normal time needed to ready a load for shipment with conventional materials.

Minnesota Mining says another favorable aspect of the taping method is the fact that no debris or "spiders" are left in the car after the load has been removed. During unloading, freight handlers merely cut the tape, pull it from the bags, roll

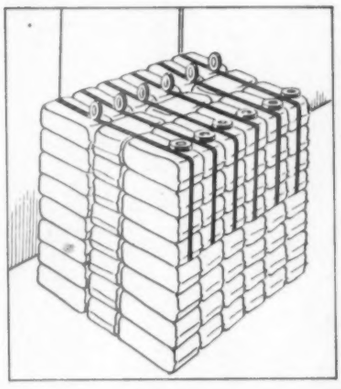

Figure 4

it into a small ball, and dispose of it in any ordinary trash container. The company also cites a safety factor, saying that in reported instances no handler or bag has been cut by the tape during application, transit or unloading.

Edward A. Winter, director of traffic for Godchaux Sugars, Inc., New Orleans, was quoted as saying that "since the adoption of the taping method, we have greatly curtailed the doorway damage to our shipments, and regained the good will of our customers."

Figure 5

Another System

Another version of the unitizing method has also been used by some shippers. Here's how it works:

In this method, the car, including the doorway area, is first loaded with all the bags intended for the shipment with wood wedges inserted between the bottom and second layers in each row on both sides of the load.

Individual bands of tape are then pulled tightly around each row. After removing the wedge on one side of the load, the tape is inserted in the opening; pulled tightly across the top of the row; and inserted in the opening on the opposite side after the wedge has been removed. (Fig. 5)

To assure tight adhesion in the opening, the wedge can be used to trowel the tape firmly against the underside of the bag. After all rows have been banded, the load is ready for shipment.

In some cases with the tape-unitizing methods, shippers may use the tape with the adhesive side out to avoid any possible defacing if the bag is printed. Also, scrap paper may sometimes be used beneath the tape to protect the bags.

The tape is used sometimes with cartons, too. Shipments of family flour cars are unitized in doorways by putting corrugated board against the load, with the corrugated board fluting horizontal so that it will bend; then the tape is put over it.

The tape also has been used with palletized loads to help hold them intact. A strip of tape 1 inch wide is circled around the top layer of bags to hold the palletized load.

Minnesota Mining representatives say the tensile strength of the filament tape is derived from thousands of continuous cable-like filaments of rayon or glass which run lengthwise with the tape.

Altogether, more than 5,000 such

(Continued on page 22a)

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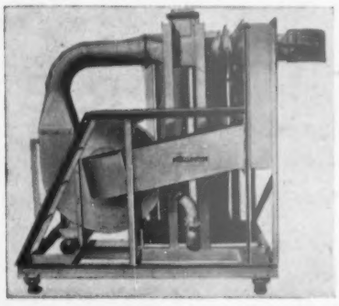
No. 2974—Brochure on Fumigation

A new, six-page brochure entitled "Your Guide to Effective and Safer Mill Fumigation with Larvacide and Aerosol Larvacide," has been published by Larvacide Products, Inc. The two-color booklet describes in detail why and how the product (Chlorpicrin) has been used for 30 years in large and small mills for protection against insects and rodents. Particular attention is given to the new aerosol form of the product. A section deals with low-cost grain fumigation. Copies of the new brochure may be obtained by checking No. 2974 on the coupon and mailing it.

No. 2968—Car Loader

New features in the Day portable pneumatic car loader for loading bulk material into boxcars have been announced by the manufacturer, The Day Co. The unit travels on casters for portability and can be used to load at many stations. When it is located at the station desired the loader is easily raised off the casters and set down to a solid, permanent position. The car loader is fed from an overhead screw conveyor through rotary valves and will load an 80,000,-lb. boxcar in from two to four hours, claims the company. The loader is equipped with two filter tubes



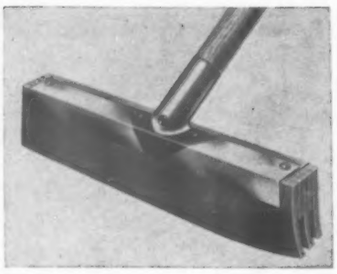
and eliminates dusting by putting a slight negative pressure on the car. The fan handles more air than is blown into the car, bleeding off a small percentage which goes into the filter tubes. When the run is completed the opening of a valve cleans out the dust accumulated in bottom of the filter and puts it into the car. For more complete details check No. 2968 on the coupon and mail it.

No. 2978—Manlift Elevators

A new two color, eight page bulletin has been released by the Humphrey Elevator Co., Inc. This bulletin illustrates the company's line of manlift elevators, which are used in flour and feed mills and grain elevators to provide ready-at-hand, simultaneous up and down transportation for employees. In addition to many "application" illustrations, included are comprehensive product data on the four standard models plus information on special equipment for them to meet various specific operating conditions and to comply with varying state codes. The bulletin is available upon request. Check No. 2978 on the coupon and drop it in the mail.

No. 6106—Broom

A new type of industrial broom has been announced by its manufacturer, the Rupo Products Co. The company



states that the broom, called the Para Broom, is constructed of flat strips of sponge rubber, fixed in an aluminum base. It is said to glide easily and collect fine waste without raising dust. A special feature is said to be that it will not clog or become matted with waste. The broom also can be used as a squeegee, to dry floors more completely after mopping. The firm states that the broom is ideal for powders, grains, feeds, milled flours and other wastes that tend to clog brooms. For more complete details check No. 6106 on the coupon and drop it in the mail.

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- ☐ No. 2982—Grain Storage
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- ☐ No. 6120—Bulk Shipment

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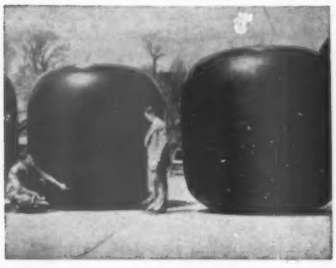
No. 6120—Bulk Shipment

A new way of handling bulk shipment of granular and powdery materials is provided by 500 gal. and 2,500 gal. synthetic rubber and fabric containers developed by the United States Rubber Co. The containers can be collapsed after emptying for return and re-use. Arrangements are now being made by the company for manufacturers to lease the containers at a monthly



rate if desired. The 370 cu. ft. or 2,500 gal. container is 8 ft. in diameter and 8 ft. high. Air or gas can be pumped into the filled container to provide additional rigidity during handling. Collapsed for storage or return shipment, it is 8 ft. long, 8 ft. wide and 2 ft. high. The 70 cu. ft. or 500 gal. container is 3 ft., 10 in. in diameter and 7 ft. high. Collapsed for storage or return shipment, it is 6 ft., 4 in. long, 3 ft. wide and 10 in. high. Both containers can be shipped by barge, rail or truck. They can be stored outdoors or indoors at point of origin, in transit or at destination by the user. They are said to be tough, non-corrosive, vermin-proof, leak-proof and weather-proof. For more complete information check No. 6120 on the coupon and drop it in the mail.

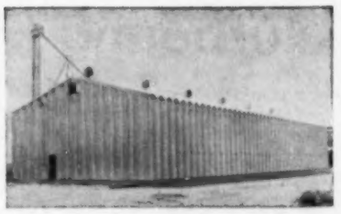
No. 2956—Control Mechanism

A positive, non-clogging feed control mechanism has been developed by the Strong-Scott Manufacturing Co. This new feeder-magnetic separator is designed to regulate the flow of material to hammer and attrition mills evenly and without surges. The machine embodies the company's new self-cleaning magnet (patent pending) to prevent tramp iron from entering the mill. A new automatic locking device insures that the feed adjustment will not change during operation after it is once set, the

company claims. An automatically controlled brush guarantees accuracy and at the same time prevents large refuse from damaging the mechanism. The scalping grid prevents large articles such as stones from entering the machine. The screen is mounted on springs which give it a floating action and prevent clogging. The machine embodies internal baffling which spreads the flow of the grain to permit the maximum efficiency of separation on the magnet. Check No. 2956 on the coupon, mail it and more details will be sent to you.

No. 2982—Grain Storage

A new type of horizontal grain storage installation has been designed and is being built at a number of locations in the United States by the Behlen Manufacturing Co. The accompanying photograph shows a structure just completed by Behlen for the Cozad Elevator Co., Cozad, Neb. The new building has a capacity of 150,000 bu. and the interior is divided into 10 storage compartments. Outside walls and compartment separations are formed of corrugated galvanized steel panels bolted together. Grain is moved into the building by a 9 in. auger and is unloaded through trenches measuring 3 by 6 ft. under the floor where there are two return auger-type conveyors running the length of the building. This system of overhead and underground augers permits the stored grain to be turned at regular intervals. Cost of this new type building is said to be much less than vertical storage. For further information, please check No. 2982 on the coupon and drop it in the mail.



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Outbound Truck Handling

By Paul E. Blodget
Faultless Milling Co.

There are three distinct classes of outbound trucks in the feed milling business:

1. Company-owned delivery trucks—These usually take an accumulation of orders and are routed a day ahead so that the trucks can, in most cases, go out fully loaded and over a route that does not double back or go too far out of line.

2. Customer-owned trucks which come into the mill to pick up feeds.

3. Bulk delivery trucks—These are usually company-owned trucks or contract haulers and in most cases they deliver directly to large consumers of various feeds.

Let's take each type separately and go over some of the problems connected with each.

Some mills have quite a large fleet of their own trucks, others may have just a few, while some mills may have no trucks but make deliveries with contract haulers who may haul full time for the mill or just part time.

Orders Accumulated Ahead

In either case most of the tonnage to be delivered is accumulated at least a day ahead of the delivery date, and the assortment of feeds to be delivered can be put into the regular warehouse stock in case it is not already carried.

In some feed plants all orders that are accumulated each day are reviewed by the warehouse foreman, and the night crew each night is instructed to add to the floor stock any items that are not regularly carried.

EDITOR'S NOTE: Feed mills' ever-present problem of handling outbound trucks is discussed in the accompanying article by Paul E. Blodget, vice president of the Faultless Milling Co., Springfield, Ill. This article is from a talk by Mr. Blodget at the convention of the Grain Elevator and Processing Superintendents in Chicago. He headed the convention symposium on handling of outbound trucks.

In most cases the handling of outbound company-controlled trucks does not present a too serious problem. In most cases all company-controlled trucks are loaded out early in the morning, thus clearing the docks for customer trucks after 8 a.m.

We then come to what I think is the big headache of truck handling, and that is trucks that come to the mill to pick up feeds. The big problem, of course, is having everything in stock for the trucker when he arrives at your dock and has not notified you that he is coming.

Most feed mills manufacture a complete line that amounts to approximately 40 to 50 different feeds, and when some of these are carried in meal, crumbles, and pellets, the different items reach a figure well above that.

Many mill operators feel that they will never have adequate space to carry finished feeds in stock. However, each situation is different, and each operator has to do the best he can with what he has. But remember that to change a mill run from its already established line-up just to fill a small order for some pick-up truck is very costly and must be avoided if at all possible.

Warehouse Stocks

Most warehouse foremen acquire some knack of keeping the right feeds in stock and do a pretty good job, but no matter how keen the foreman's foresight, the unexpected will crop up and he will have a run on an item and have to call on the mill for help.

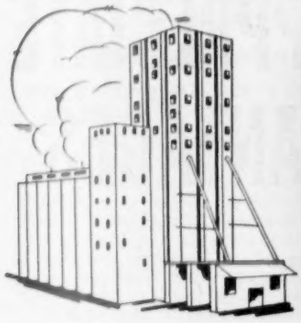
It is pretty evident that trucks coming in picking up feeds can only be handled successfully from warehouse stock, and then the big problem is storage room for an adequate assortment and volume. The amount of feeds in stock will vary, but one can plan on having to carry about four times the amount of each day's turnover to have enough of the right assortment in stock each morning.

In loading out either company controlled or customer trucks, an accurate count must be maintained to insure customer satisfaction and prevent company losses.

Loading crews must be comprised of people who are accurate and careful. They must be trained to be courteous to customers and get the feeds to the truck in an accurate, orderly manner.

Good relations must be maintained at all times with the truck driver, even though he is not the actual dealer. Naturally he does not like it when he has to wait to be loaded and, if that should happen, a pleasant place in which to wait is very desirable. Some feed companies have free coffee served to waiting drivers.

These public relations activities are very important because the truck



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This is the crux of grain fumigant performance. This is what you get with Weevil-Cide to a degree you can equal with no other grain fumigant.

You may search official or competitive sources in vain for any similar recognition of or remedy for this vital factor.

In that connection we note on many competitive labels a rather vague dosage range, with little or no concise definition of when to use the higher or lower recommendation. In short, dosage discretion is largely left up to the user. We see other dosages we know from long observation to be inadequate. We find still other dosages that, if followed, would be excessive and costly.

Very often, part of the true treating cost is concealed in a recommendation for extra dosage to be added to the first and last draft.

DOSAGE CHART FROM A WEEVIL-CIDE LABEL

WARNING: Do Not Enter Elevator Bins at Any Time to Pour Fumigant.

WEEVIL-CIDE DOSAGES FOR ELEVATOR BINS

Dosages are for equivalent results in various types and sizes of bins under the differences in resistance created by varying degrees of grain condition as indicated by grain temperature.	STEEL BINS		CONCRETE BINS			WOODEN BINS		
	MEDIUM OR LARGE (Over 5,000 bu.)	SMALL (5,000 bu. or less)	LARGE (Over 20,000 bu.)	MEDIUM (5,000 bu. to 20,000 bu.)	SMALL (Under 5,000 bu.)	CRIB BINS LARGE (5,000 bu. and over)	CRIB BINS SMALL (Under 5,000 bu.)	STUDDING BINS
	1 gal.	1¼ gal.	1¼ gal.	1½ gal.	1¾ gal.	2 gal.	2¼ gal.	2½ gal.

per thousand bushels of grain (1250 cubic feet of bin space).

THESE DOSAGES ARE RECOMMENDED FOR GRAIN TEMPERATURES OF NOT OVER 85° F. (EXCEPT FOR HIGHER SUMMER GRAIN TEMPERATURES.)

FOR GRAIN TEMPERATURES ABOVE 85° F. RESULTING FROM INSECT INFESTATION, HIGH GRAIN RESPIRATION, OR BOTH: CONDITION GRAIN BY AN EXTRA TRANSFER AND AERATION BEFORE TURNING AND TREATING—IF AT ALL POSSIBLE. OTHERWISE, INCREASE ABOVE DOSAGES BY ¼ TO ½ GALLON PER THOUSAND BUSHELS, DEPENDING ON GRAIN CONDITION.

Now everyone understands that dosage must vary with bin size and type of bin structure. What is far less understood is the need for extra dosage or preferably, **preconditioning,** to compensate for "off" grain condition resulting from high moisture, high grain respiration or serious insect heating.

Weevil-Cide dosage recommendations are therefore accompanied by advice on preconditioning as the best remedy for adverse grain factors.

By contrast, the Weevil-Cide label carries a precise schedule of dosages tailored to fit the widest range of well-defined grain storage conditions.

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driver actually represents the dealer and considerable business might be lost through indifferent treatment of drivers.

Some drivers seem very indifferent about the condition of their trucks, and I think that in most cases mills should offer to furnish trucks regular car lining paper to cover the floors and walls in case of roughness or dirty condition. This is very important if the bags are to arrive in a clean, salable condition.

Bear in mind that in handling trucks it is the pick-up or customer truck that represents the largest number of problems, the principal one of which is adequate warehouse stocks to meet any situation.

Some mills have instituted a policy of requiring the customer to call in the day before making the pick-up. This is a splendid idea if you can get it done, but it does not always work. Some dealers are very cooperative, but others are not. However, any plan to get advance notice of feed pick-ups will greatly smooth out truck handling.

In regard to storage and stocks of finished feeds, different mills have various methods and locations within their plants for this. Most common method is to have the feeds stored on the first floor adjacent to the dock area. The feeds are then either trucked by hand truck or pallet tractor to the waiting trucks.

I prefer the storing of stocks on the second floor and dropping the bags down chutes to a table that the trucker backs up to. He can then load the truck from this chute or table end without having to pick the bags up from the floor.

In this manner of loading the bags are usually dropped one at a time at a rate that the driver can handle alone. One man in the second floor warehouse can handle the feeds to the chute easily.

Another method of handling from warehouse to truck is by conveyor belt. However, except in a few cases, this method is not used extensively.

Bulk Delivery

Then, we come to the third class of trucks—bulk delivery trucks. As I noted before, most of these are company-owned and deliver direct to the consumer.

Bulk trucks first started in areas where there was a large consumption of feeds by large herds of dairy cows and large turkey and poultry feeding areas, mostly in California. This started also at a time during World War II when both cotton and burlap bags were high in price and in very short supply, paper bags being almost non-existent.

Bulk trucks have changed from the original type of wooden boxes with chain drag unloaders to modern aluminum bodies with screw conveyor unloaders and elevators, and in most cases bulk feeds are unloaded into bins on the second floor of farm buildings.

The delivery of feeds in bulk to large herd and flock owners has expanded considerably from its start during the war years. However, for bulk delivery to be practical, the mill must be located in an area where there is enough concentration of livestock or poultry raised in large scale operations. To try to service the average farm is not generally considered practical or economical.

In order to handle bulk trucks properly, most mills have limited the kinds of bulk feeds to a few and have installed bulk bins to stock the feeds for loading out to the truck with very little lost time for the truck. The investment necessary to handle this kind of operation is considered high, and the savings may not be as great as originally thought.

After a five-year study the Albers Milling Co. reported that a bulk truck body runs into a figure of $5,000 to $13,000 and that some mills had invested almost $70,000 in bulk handling equipment.

Also, to receive feed in bulk, the feeder must build suitable storage. Albers said that bulk delivery should be limited to areas where there are a number of large feeders close by and that it would not be practical to replace bagged feeds in most areas.

When one considers the present price of 50-lb. paper bags there is not as much saving between bulk and bagged feeds as prevailed at the time textile bags were high. Also, the 50-lb. size is more acceptable to the feeder.

—BREAD IS THE STAFF OF LIFE—

SPOUT IT DOWN

Handling floor sweepings in grain elevators and similar buildings may not be a problem in many plants, but here is an idea that was adopted at one of the Ralston Purina Co. plants.

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One plant has such a "sweep box" spout from each floor of an old elevator building where the upper floors are reached only by stairs, and has found it saves a lot of time in housekeeping.

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Knox Top Soft Winter Wheat in Illinois Tests

URANA, ILL.—Knox, a new soft winter wheat, and Pawnee, an old favorite among the hard wheat varieties, rank as the top winter wheat choices in Illinois for this fall. These varieties came through with outstanding performances in yield tests in the state this past year, according to the University of Illinois.

In five test plots, Knox averaged about 49 bu. an acre, considerably more than most other soft wheat varieties. In the five tests, Saline averaged nearly 46 bu. and Vigo and Seneca averaged about 43 bu., while Royal yielded an average of 41 bu.

J. W. Pendleton, crop production specialist at the university, says Knox made an outstanding yield record even though 1954 was a good wheat year and yields were above average.

A supply of Knox seed will be available this year for the first time. The other soft wheat varieties recommended for Illinois are Saline, Vigo, Royal and Seneca. All of them are resistant to soil-borne mosaic.

In addition to Pawnee, other hard wheat varieties that showed up well in the tests are Triumph and Westar. Westar matures later than the other two varieties and is resistant to the soil-borne mosaic.

TAPES

(Continued from page 17a)

"cables" are used per inch of tape width. They are permanently imbedded in the elastic, shock-proof, pressure-sensitive adhesive on the face of the tape, reinforcing it like steel rods reinforce concrete or steel cables support suspension bridges.

Tensile Strenth

The rayon reinforced tape provides 180 lb. of tensile strength per inch of tape width, while two glass reinforced tapes provide 325-lb. and 500-lb. tensile strength, respectively, per inch of tape width.

Another type of tape is also being used in boxcar shipments. This masking-type tape is used to replace staples for holding carliner paper to the side walls of the car. Many cars contain numerous small wire staples used to attach paper to the walls, and these staples are seldom, if ever, removed after original use. These staples can cause a large amount of damage, particularly to sacked commodities, Minnesota Mining officials note. Instead of staples, some shippers are using the tape to attach the paper to the side walls.

AEROSOL

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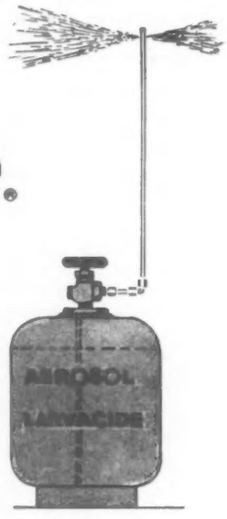

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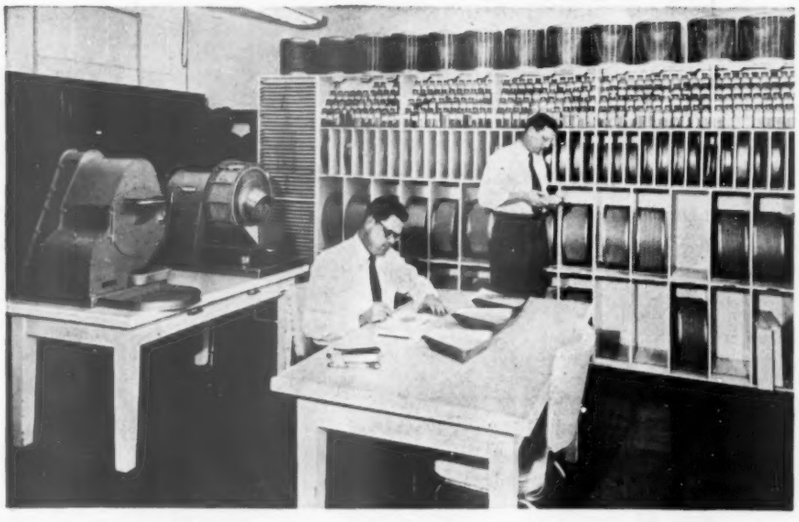

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The Hart Uni-Flow laboratory model (far left) is used for tests of length sizing and separating.

The Carter Precision Grader laboratory model (center) is used for either thickness or width sizing.

The Carter Disc Separator laboratory model (right) is used to determine the equipment required for precise length sizing or separating.